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GB 2002652 A GB 1126568 A GB 1048984 A
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(54) Evaporation preventative for cement mortar and concrete

(57) Mixtures of aqueous paraffin emulsions with corresponding emulsions of hydrocarbon resins. when used as evaporation preventatives for cement mortar and concrete, begin to weather after a short time, but primarily have excellent barrier factors.

Evaporation preventative for cement mortar and concrete

The invention relates to a new evaporation preventative and its usage on cement mortar and concrete.

Water may evaporate from freshly-placed mortar or concrete to such an extent that there is no longer sufficient available for hardening. Two ways of overcoming this are the addition of moisture to the surface of the concrete, and the application of a barrier layer. Protection from drying out should, if possible, commence immediately after placement of the concrete or mortar, since shrinkage cracks may quickly form in concrete which has not yet solidified, especially when there is exposure to wind draughts. The danger of drying out is especially great if the temperature of the concrete is higher than that of the surrounding air (e.g. in winter). Thus, the surface of concrete must be kept moist for up to 7 days and even longer for cements which harden especially slowly. Keeping the concrete moist for long periods is a necessity, in particular when it must fulfil special requirements, e.g. low shrinkage, impermeability to water, frost-dew salt resistance, high abrasive resistance, etc.

Until now, various processes have been used to post-treat concrete, and these have various advantages and disadvantages, examples being post-treatment with direct water supply; post-treatment with covers which are kept moist; foil covers and film-forming post-treatment agents. A variety of film-forming post-treatments, commonly known as "concrete curing compounds", are known. They are often based on organic solvent solutions or aqueous dispersions of such materials as paraffin waxes and are generally applied by sprays to give a cover of sufficient thickness. Usually, spraying must not commence until the surface is only slightly moist. By this time, however, much water has already evaporated. Rapid evaporation of the solvent, or demulsifying of the emulsion produces a dense film which covers the

surface of the concrete but is not absorbed by it, and to a large extent (depending on the curing efficiency index) prevents evaporation of water from the concrete. "Curing Efficiency Index", a measure of the ability of a material to prevent water loss by evaporation, is defined in British Ministry of Public Building and Works General Specification No. 201, Appendix B). The protective film eventually rots as a result of atmospheric, weather and mechanical influences. Mechanical damage to the film must be avoided for at least the first seven days.

Post-treatment films which do not weather (rot) at all or which do so only very slowly may impair or prevent the adhesion of plaster, flooring finishes, coatings, adhesives, paints etc., which are to be applied later. On the other hand, the use of environmentally unacceptable organic solvents such as benzene, aromatic hydrocarbons and chlorinated hydrocarbons is to be avoided as much as possible, and film formers which have rapid biological degradation in aqueous systems should be employed.

Of the known products, various aqueous paraffin emulsions have proved to be especially favourable in their cost-efficiency ratio. However, these have the disadvantage of rotting particularly slowly, especially on concrete surfaces which are not exposed to the sun or other weather influences, and they consequently impair the adhesion of subsequent plaster, flooring finishes, coatings, paints, etc.

It is therefore the aim of the invention to develop paraffin emulsions which begin to weather after only a short time (but more than seven days), thus breaking up the film and accelerating the weathering of the paraffin part.

It has now been found that aqueous paraffin emulsions which also contain natural or synthetic hydrocarbon resins not only start to weather after a short time, but also

have excellent efficiency indexes as evaporation preventatives.

The invention therefore provides a curing compound for cementitious compositions, consisting of a blend of at least one aqueous paraffin emulsion and at least one natural or synthetic hydrocarbon resin.

By "paraffin emulsion" is meant an aqueous emulsion of a higher alkane having a fusion point above ambient temperature, which upon drying of the emulsion does not form a film in the sense that a paint forms a film (see also Römpp "Chemie Lexikon", 9th edition (Thieme Verlag 1989), volume 1, page 102, the contents of which are incorporated herein by reference). The emulsion may be stabilized by any convenient means, but it is preferable to use an anionically-emulsified paraffin mixture (fusion point of 45-51°C) with a particle size of less than 2µ. Examples of such paraffin emulsions are Mobilcer 55 or Mulrex 62 from Mobil and UBATOL FPG 860 from Cray Valley.

By "hydrocarbon resin" is meant a compound belonging to the class of products described in Kirk-Othmer's "Encyclopedia of Chemical Technology, 3rd Ed., Volume 12, pages 852-869, the contents of which are incorporated by reference. These are low molecular weight thermoplastic polymers derived from different materials. Preferred hydrocarbon resins are the so-called "terpene" and "petroleum" resins as well as "resins from pure monomers" as described in the reference.

Examples of natural and synthetic hydrocarbon resins suitable for use in this invention are tall resin, colophony, "Escorez" (trade mark) synthetic resins of the No. 1000 type from Esso, "Petrosin" (trade mark) resin from Mitsui, "Resen" (trade mark) from Faime or Necires resins from various companies, as well as mixtures thereof. The active materials are thermoplastic polymers having a molecular weight of below

2000 which form dense films from solutions in organic solvents (see also Römpp, 9th edition, volume 3, page 2291). An especially preferred material is an anionically-dispersed tall resin which is stabilized with casein, from the company Krems Chemie (particle size less than 2 µ).

The components paraffin and hydrocarbon resin are present in a solids weight ratio of 95:5 to 30:70, preferably 70:30 to 50:50. The solids content of the emulsions may vary within a wide range, provided that it can be sprayed with the usual devices. In general, this content is 10 to 60 percent by weight, preferably between 15 and 40 percent by weight. Emulsions having a lower solids content may need to be sprayed several times in order to reach the required amount to be applied (consumption of 80 g/m² to 250 g/m²).

As well as the components paraffin and natural or synthetic hydrocarbon resin, further constituents, which are already known as evaporation preventatives, may also be present. Those which may be used are emulsions of synthetic polymers based on various chemicals, such as polyvinyl acetates, styrene-butadiene resins, styrene-acrylates, diverse acrylate copolymers or other resins (epoxy), rubbers and chlorinated rubbers, as well as mixtures thereof, provided that they are compatible with paraffin or wax and hydrocarbon resin.

The following comparison examples illustrate the properties of the conventional evaporation preventatives.

Comparison example 1

Evaporation preventative based on colophony and white spirit, 25% solids, coverage rate 180 g/m²; efficiency index according to Austrian guidelines RVS 11.064: 95.9%.

Comparison example 2

Paraffin emulsion ("Mobilcer" (trade mark) 55 from Mobil), anionic-non-ionogenic, 20% solids, coverage rate 100 g/m^2, efficiency indexes; when applied immediately after placement of the concrete surface: 24.2%, when applied 2 hours after placement of the concrete surface: 86.9%. This value exceeds the minimum requirement of 85%.

Comparison example 3

Paraffin emulsion ("UBATOL" (trade mark) FPG 860 from Cray Valley), anionic-non-ionogenic, 20% solids substance, coverage rate 100 g/m^2. Efficiency index when applied immediately after placement of concrete: 5.06%. Efficiency index when applied 2 hours after placement of concrete: 73.27%.

Comparison example 4

KW resin emulsion ("SACOCELL" (trade mark) 309 from the company Krems-Chemie), anionic, 30% solids, coverage rate 100 g/m^2. Efficiency index when applied immediately after placement of concrete: 14.9%. Efficiency index when applied 2 hours after placement of concrete: 8.53%.

With the results of these comparison examples in mind, it would be expected that, when using mixtures of paraffin emulsions and hydrocarbon resin emulsions, a reduction in the relatively good efficiency index of the paraffin emulsion would take place. However, it has surprisingly been shown that there is a significant improvement. For an aqueous system, it is also particularly surprising that the efficiency index may be raised to over 70% when applied immediately after placement of the concrete.

EXAMPLE 1

Mixture of paraffin emulsion as in comparison example 2 and hydrocarbon resin emulsion as in comparison example 4, in a ratio of solids contents of 7:1, solid content of the mixed product 20%, coverage rate 100g/m². Efficiency index when applied immediately after placement of concrete: 56.2%. Efficiency index when applied 2 hours after placement of concrete: 89.5%.

EXAMPLE 2

Paraffin emulsion as in comparison example 3 with hydrocarbon resin as in comparison example 4, mixture ratio and solids content as in example 1, coverage rate 100g/m². Efficiency index when applied immediately after placement of concrete: 46.40%. Efficiency index when applied 2 hours after placement of concrete: 87.20%.

EXAMPLE 3

Paraffin emulsion as in comparison example 2 with hydrocarbon resin as in comparison example 4, mixture ratio of the dry constituents 1:1, with a solid content of 20%; coverage rate 100g/m². Efficiency index when applied immediately after placement of concrete: 71.5%. Efficiency index when applied 2 hours after placement of concrete: 52.8%.

EXAMPLE 4

50 parts of water are mixed with 38.88 parts of a paraffin emulsion (commercially available as MULREX (trademark) 62 from MOBIL) and 11.12 parts of the

hydrocarbon resin emulsion of comparison Example 4 (the emulsion being commercially available as SACOCELL (trademark) 309 from Krems Chemie). The efficiency index obtained is 86.82%. In comparison, a mixture of 50% water and 50% MULREX 62 gives an efficiency index of 81.83%.

PATENT CLAIMS

1. Aqueous paraffin emulsions, which contain natural or synthetic hydrocarbon resins as an additional component.

2. Aqueous paraffin emulsions according to claim 1, characterized in that the paraffin is a higher C_{17-150}alkane have a fusion point above 25°C.

3. Aqueous paraffin emulsions according to claim 1, characterized in that they contain as the hydrocarbon resin tall resin, colophony, Escorez (ESSO), Petrosin (MITSUI), Resen (FAIME), Necires (various companies) or similar products.

4. Aqueous paraffin emulsions according to any one of the preceding claims characterized in that they contain paraffin and hydrocarbon resin in a ratio of 95:5 to 30:70, based on dry substance.

5. Aqueous paraffin emulsions according to any one of the preceding claims characterized in that they have a solid content (paraffin resp. wax and hydrocarbon resin) of 10 to 60 percent by weight, preferably 15-40% by weight.

6. Use of the aqueous paraffin emulsions according to any one of the preceding claims as evaporation preventatives for cement mortar and concrete.

7. A process for protecting a cementitious composition from evaporation comprising

   a) applying the cementitious composition followed by
   b) applying an aqueous paraffin emulsion according to any one of claims 1 to 5.

8. A process according to claim 7 in which application of the emulsion occurs 1 to 3 hours after applying the cementitious composition.

9. A process according to any one of claims 6 to 8 in which the cementitious composition is concrete or cement mortar.

10. A process according to any one of claim 6 to 9 in which the amount of emulsion is 80g/m^2 to 250g/m^2 based on the surface of cementitious material to which the emulsion is applied.

11. A cementitious surface, to which an aqueous emulsion according to claims 1 to 5 has been applied.

12. A cementitious surface to which 80g/m^2 to 250g/m^2 of an aqueous emulsion according to any one of claims 1 to 5 has been applied.

Patents Act 1977
Examiner's report to the Comptroller under Section 17 (The Search Report)

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Databases (see over)
(i) UK Patent Office

(ii) ONLINE DATABASES: WPI AND CLAIMS

Date of Search
14 SEPTEMBER 1993

Documents considered relevant following a search in respect of claims 1-12

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
X	GB 2002652 A (L'OREAL) - Examples 1,4	1,4
X	GB 1126568 A (ESSO) - Example	1-5
X	GB 1048984 A (GULF) - Examples D, G, H, J	1,2,3,5
X,P	US 5120355 A (NIPPON OIL) - Examples	1-5
X	US 4439563 A (MEADOWS) - whole document	1-3,5-7, 9,11
X	JP 590172543 A (NIPPON OIL) - Derwent Abstract	1,2,4

Category	Identity of document and relevant passages	Relevant to claim(s)

Categories of documents

X: Document indicating lack of novelty or of inventive step.

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P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

&: Member of the same patent family, corresponding document.

Databases: The UK Patent Office database comprises classified collections of GB, EP, WO and US patent specifications as outlined periodically in the Official Journal (Patents). The on-line databases considered for search are also listed periodically in the Official Journal (Patents).

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